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DERWENT-WEEK: 199423

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TITLE: Electrically conductive compsn. contains vapour phase  
growth carbon fibres, carbon black, thermoplastic resin  
and/or thermosetting resin

INVENTOR: FUKADA H; KATO N

PATENT-ASSIGNEE: NIKKISO CO LTD[NIKKN] , NIPPON ACHESON KK[ACHE]

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APPLICATION-DATA:

PUB-NO	APPL-DESCRIPTOR	APPL-NO	APPL-DATE
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CIPS	C08K3/02	20060101
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ABSTRACTED-PUB-NO: JP 06122785 A

BASIC-ABSTRACT:

An electrically conductive compsn. contg. vapour phase growth C fibres, a C black, a thermoplastic resin and/or thermosetting resin. An electrically conductive coating medium or ink contg. the electrically conductive compsn. An electrical circuit substrate having a circuit made from the electrically

conductive compsn.

Pref. one of the vapour phase growth carbon fibres (CF-1) have a fibre dia. of 0.8 microns and a fibre length of 10 microns. The C black is e.g. Kettchen black (RTM). The thermoplastic resin is e.g. a butyral resin. The thermosetting resin is e.g. a phenolic resin.

USE/ADVANTAGE - The electrically conductive compsn. is used for low resistant bands, antistatic conveyer belts, conductive rubber products, and electro-magnetic shielding material. It has a high electrical conductivity and high antistatic properties. The electric circuit has a high adhesivity to the substrate.

In an example, a mixt. comprising 85 pts. wt. of a phenolic resin, 15 pts. wt. of a butyral resin, and 100 pts. wt. of Carbitol was mixed with 25-40 pts. wt. of CF-1 and 10 pts. wt. of Kettchen black and kneaded to give compositions. Polyester sheets were printed with the compositions and cured at 150 deg.C for 30 min to give a coating thickness(dry) of 25 microns. The coating membranes had resistivities of curve (3), as opposed to curve (2) for comparative example products in which Kettchen black was omitted and curve (1) for comparative example products in which CF-1 were omitted.

CHOSEN-DRAWING: Dwg.1/1

TITLE-TERMS: ELECTRIC CONDUCTING COMPOSITION CONTAIN VAPOUR PHASE  
GROWTH CARBON  
FIBRE BLACK THERMOPLASTIC RESIN THERMOSETTING

DERWENT-CLASS: A85 L03 V04 X12 X25

CPI-CODES: A08-M09A; A08-S04; A09-A03; A12-E01A; A12-H01; L03-A02B; L03-A02E;  
L03-H04B;

EPI-CODES: V04-R02P; V04-U01;

UNLINKED-DERWENT-REGISTRY-NUMBERS: 1669U; 5085U ; 5086U

ENHANCED-POLYMER-INDEXING:

Polymer Index [1.1]

017 ; P0226 P0282\*R; H0328;

Polymer Index [1.2]

017 ; H0317; P1672 P1865;

Polymer Index [1.3]

017 ; ND01; ND04; B9999 B3269 B3190; Q9999 Q7498 Q7330; Q9999

Q7330\*R; B9999 B3305 B3292 B3190; Q9999 Q7909 Q7885; K9574 K9483;

Polymer Index [1.4]

017 ; D00 D09 C\* 4A R01669 2211; D00 D09 C\* 4A R05085 2211; D00 D09 C\*  
4A R05086 200716; A999 A602 A566; S9999 S1070\*R; K9745\*R;

Polymer Index [2.1]

017 ; P0839\*R F41; S9999 S1285\*R; S9999 S1581;

Polymer Index [2.2]

017 ; ND01; ND04; B9999 B3269 B3190; Q9999 Q7498 Q7330; Q9999  
Q7330\*R; B9999 B3305 B3292 B3190; Q9999 Q7909 Q7885; K9574 K9483;

Polymer Index [2.3]

017 ; B9999 B5481 B5403 B5276;

POLYMER-MULTIPUNCH-CODES-AND-KEY-SERIALS:

Key Serials: 0147 0150 0153 0218 0221 0226 0231 1277 1288 1992 2020 2274 2513  
2522 2524 2551 2553 2737 2743 2747

Multipunch Codes: 02& 04- 040 08& 10- 140 15- 17& 17- 231 232 233 307 318 321  
473 481 506 509 511 623 627 629 630 722 02& 04- 143 435 502 506 509 511 623 627  
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(71)Applicant : NIKKISO CO LTD  
NIPPON ACHISON KK

(22)Date of filing : 10.12.1991

(72)Inventor : KATO NAOKI  
FUKADA HIROYUKI

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**(54) CONDUCTIVE COMPOSITION, CONDUCTIVE COATING MATERIAL, CONDUCTIVE INK, AND ELECTRIC CIRCUIT BOARD**

**(57)Abstract:**

**PURPOSE:** To obtain a conductive compsn. suitable for forming a conductive path of an electric circuit by compounding a vapor-growth carbon fiber, a carbon black, and a resin component.

**CONSTITUTION:** A conductive compsn. contains a vapor-growth carbon fiber, a carbon black, and a resin component comprising a thermoplastic resin and/or a thermosetting resin and is used for preparing a conductive coating material or a conductive ink suitable for forming a conductive path. The compsn. usually contains 30-75wt.% resin component. When the compsn. is used as the conductive coating material and the conductive ink, the sum of the amts. of the carbon fiber and the carbon black is pref. 60wt.% or lower.

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CLAIMS

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[Claim(s)]

[Claim 1]A conductive composition containing vapor-phase-epitaxy carbon fiber, carbon black, thermoplastics, and/or thermosetting resin.

[Claim 2]A conductive paint containing said conductive composition according to claim 1.

[Claim 3]Conductive ink containing said conductive composition according to claim 1.

[Claim 4]An electric circuit board having the track formed with said conductive composition according to claim 1.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application]This invention about a conductive composition, a conductive paint, conductive ink, and an electric circuit board in more detail, It has the track formed using the conductive composition provided with high conductivity, the conductive paint formed using the conductive composition, conductive ink, and its conductive composition, and is related with the high electric circuit board of adhesion with a substrate.

[0002]

[The technical issue which a Prior art and an invention tend to solve] Conventionally, the track in an electric circuit board was formed by, for example, applying the paint containing metal powder or a metal fiber to a substrate. However, since the track formed using said paint contained metal, when the problem that conductivity falls when metal oxidizes with the passage of time, or the electric circuit board was incurvated or was bent, there was a problem that a track exfoliated from a substrate.

[0003]In order to solve the problem of the conductive fall by metaled corrosion, the trial in which use carbon fiber or carbon black instead of metal, and a conductive paint is formed is also made, but the track using such a conductive paint does not have the conductivity of a like, when using metal. Since a void increases into the track formed in such conductive paints even if it forms a track in the conductive paints which blended carbon fiber or carbon black in large quantities, and prepared it, in order to cancel this fault and to gain sufficient conductivity, there is no conductive improvement like it expects.

[0004]This invention is aimed at solving said technical problem. Namely, by using a suitable conductive composition for the purpose of this invention to form the track in an electric circuit, a suitable conductive paint to form a track using this conductive composition and conductive ink, and said conductive composition, It aims at providing the electric circuit board which has

the track whose adhesion over a substrate improved.

[0005]

[Means for Solving the Problem]The invention according to claim 1 for solving said technical problem is a conductive composition containing vapor-phase-epitaxy carbon fiber, carbon black, thermoplastics, and/or thermosetting resin.

Are it a conductive paint by which it is characterized that the invention according to claim 2 contains said conductive composition according to claim 1, and the invention according to claim 3, It is conductive ink containing said conductive composition according to claim 1, and the invention according to claim 4 is an electric circuit board having the track formed with said conductive composition according to claim 1.

[0006]Hereafter, this invention is explained in more detail.

(1) A conductive composition of conductive composition this invention contains vapor-phase-epitaxy carbon fiber, carbon black, thermoplastics, and/or thermosetting resin.

- As vapor-phase-epitaxy carbon fiber used for vapor-phase-epitaxy carbon fiber-this invention, what is called a creation minute carbon fiber can be mentioned, for example. As said creation minute carbon fiber, the seeding method, vapor-phase-epitaxy carbon fiber by a gas flow method, etc. can be mentioned, for example.

[0007]This vapor-phase-epitaxy carbon fiber can be obtained by, for example, heating and carrying out the pyrolysis of carbon compounds, such as benzene, methane, and carbon monoxide, and the organotransition metal compound containing iron which is a catalyst, nickel, etc. to 800-1,300 °C in carrier gas, such as hydrogen. Into what kind of diameter and length this vapor-phase-epitaxy carbon fiber is grown up responds, and cooking time is determined.

[0008]Said vapor-phase-epitaxy carbon fiber is not limited to what is obtained by a manufacturing method of said illustration, As long as it, in short, obtains a compound used as a carbon source with a manufacturing method which can form carbon fiber by a floating state by a catalysis of a transition metal, it may be obtained by what kind of manufacturing method.

When vapor-phase-epitaxy carbon fiber is produced continuously as mentioned above, tarry material may adhere to the surface. In such a case, it is preferred for a solvent to wash obtained vapor-phase-epitaxy carbon fiber, or to heat-treat at 500-1,000 °C in an inactive air current.

[0009]Graphitization textiles produced by heat-treating said vapor-phase-epitaxy carbon fiber are contained in vapor-phase-epitaxy carbon fiber in this invention. Especially these graphitization textiles can be obtained by heating said not less than 2,000 °C of vapor-phase-epitaxy carbon fiber for more than 30 minutes at 2,000-3,000 °C, for example.

[0010]By the way, a conductive composition in this invention is presenting the state where vapor-phase-epitaxy carbon fiber and carbon black distributed, into a resinous principle which

is a matrix. This dispersion state is easily observable with an electron microscope. In order to have conductivity in this state, vapor-phase-epitaxy carbon fiber and carbon black need to be a contact state electrically. For that purpose, about vapor-phase-epitaxy carbon fiber, it is preferred to have a certain amount of diameter and fiber length. If the fiber length is too brief in a diameter of vapor-phase-epitaxy carbon fiber being small, It is because conductivity may not fully be revealed if contact of vapor-phase-epitaxy carbon fiber or contact with vapor-phase-epitaxy carbon fiber and carbon black may not fully be realized and contact is insufficient. But if a fiber length of vapor-phase-epitaxy carbon fiber excels again, it will not be the long thing that it is moderate, either. Too long vapor-phase-epitaxy carbon fiber is because it may stop being able to secure sufficient contact with other vapor-phase-epitaxy carbon fiber or carbon black by causing condensation. Therefore, a desirable fiber diameter and a fiber length for a conductive composition to reveal sufficient conductivity exist in vapor-phase-epitaxy carbon fiber in a meaning containing these graphitization textiles. But if a fiber length and a fiber diameter of vapor-phase-epitaxy carbon fiber are larger as they excel or, they are not the large thing that it is moderate, either. It is because vapor-phase-epitaxy carbon fiber causes condensation in matrix resin and it may stop being able to maintain sufficient electric contact with vapor-phase-epitaxy carbon fiber or vapor-phase-epitaxy carbon fiber, and carbon black, when a fiber diameter is too long. The smaller one of a textiles number in the same content increases, and conductivity of a diameter of textiles improves. However, if too small, it will become that it is easy to be cut at the time of processing. Therefore, a desirable range will exist in a fiber diameter and a fiber length of vapor-phase-epitaxy carbon fiber which exist in a conductive composition. a fiber diameter of vapor-phase-epitaxy carbon fiber in a conductive composition which has sufficient conductivity according to this artificer's examination -- usually -- 0.2-1.5-micrometer 0.1-2.0 micrometers are 0.3-1.0 micrometer especially preferably preferably. 5-200 micrometers of fiber length are usually 10-100 micrometers preferably.

[0011]Vapor-phase-epitaxy carbon fiber which presents use with a conductive composition according to for what kind of use it is used further has a desirable diameter and length. a desirable range which vapor-phase-epitaxy carbon fiber in a conductive composition mentioned above when put in another way -- fiber length -- and it is made to have a fiber diameter -- being alike -- it mentioned above -- fiber length -- and what is necessary is not just to mix vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle which have a fiber diameter necessarily For example, when preparing a conductive paint using a conductive composition, since vapor-phase-epitaxy carbon fiber in particular does not receive high shearing when preparing, the vapor-phase-epitaxy carbon fiber with which use is presented should just have a fiber length and a fiber diameter which were mentioned above, but. In preparing conductive ink using a conductive composition, Since vapor-phase-epitaxy carbon



fiber may be cut especially in response to high shearing when preparing and there is a problem of screen permeability at the time of printing, vapor-phase-epitaxy carbon fiber with which use is presented is wanted to have a fiber length and a fiber diameter of vapor-phase-epitaxy carbon fiber in inside of a conductive composition. That is, 5-90 micrometers of fiber lengths of vapor-phase-epitaxy carbon fiber with which use which hits preparing conductive ink using a conductive composition is presented are usually 10-60 micrometers preferably. 0.2-2.0 micrometers of fiber diameters are usually 0.4-1.5 micrometers preferably. Since conductive ink may pass a screen at the time of the use, in such a case, a desirable range [ in / in a fiber length and a fiber diameter of vapor-phase-epitaxy carbon fiber / said range ] becomes advantageous.

[0012]Content of vapor-phase-epitaxy carbon fiber in a conductive composition is usually 30 to 50 % of the weight preferably 20 to 60% of the weight. If content in a conductive composition of vapor-phase-epitaxy carbon fiber is less rather than said range, The conductivity of a conductive composition may not fully be revealed, and if content of vapor-phase-epitaxy carbon fiber exceeds said range, content of a resinous principle will decrease relatively, and even if it forms a track with this conductive composition, that track exfoliates easily.

[0013]- As carbon black which is used in preparing a carbon black conductive composition, carbon black manufactured by various kinds of processes can be used. As carbon black which can be used conveniently, Gas black, oil black, acetylene black, etc. which can mention furnace black, channel black, thermal black, Ketchen black, etc., and are classified according to a difference of a raw material can be further mentioned as a good example. Carbon black desirable also in these is acetylene black and Ketchen black.

[0014]When vapor-phase-epitaxy carbon fiber and carbon black are distributing in a resinous principle which is a matrix, conductivity has revealed a conductive composition concerning this invention. About a reason for a manifestation of this conductivity, it is still a research way and a clear thing cannot be declared. However, as mentioned above, that from which an electric chain is formed by contact of vapor-phase-epitaxy carbon fiber and contact with vapor-phase-epitaxy carbon fiber and carbon black, and conductivity is obtained is presumed, but. It is presumed again that conductivity between vapor-phase-epitaxy carbon fiber and between vapor-phase-epitaxy carbon fiber and carbon black is revealed according to the tunnel effect on both sides of an about 100Å resinous principle.

[0015]Even though conductivity is revealed with which mechanism, structure is developed, carbon black which can give good conductivity has small particle diameter, and its surface area is large, and it is porosity.

It is desirable that it is high crystallization.

[0016]Therefore, as carbon black used for this invention, it is preferred that the amount of oil

supply is 90ml (DBP)/not less than 100g. It is because it is easy to take structure structure and higher conductivity is demonstrated. 30-500 nm of particle diameter of car BONN black is usually 30-1100 nm preferably.

It is preferred that a BET value is 20-50m<sup>2</sup>/g as specific surface area.

[0017]In this invention, can use commercial carbon black and specifically, R-14 (specific surface area 45m<sup>2</sup>/g.) of Colombia carbon Japan Particle diameter 68mmicro, R-420 (specific surface area 25m<sup>2</sup>/g, particle diameter 68mmicro), R-450 (Specific surface area 33m<sup>2</sup>/g, particle diameter 62mmicro) R-MT-P (specific surface area 8m<sup>2</sup>/g.) SterlingV by particle diameter 280mmicro and Cabot Corp. (specific surface area 35m<sup>2</sup>/g.) particle diameter 50mmicro and SterlingNS (specific surface area 25m<sup>2</sup>/g.) particle diameter 75mmicro and SterlingSO (specific surface area 42m<sup>2</sup>/g.) #22B by particle diameter 41mmicro and Mitsubishi Kasei Corp. (specific surface area 55m<sup>2</sup>/g.) Particle diameter 40mmicro, #20B (specific surface area 56m<sup>2</sup>/g, particle diameter 60mmicro), CF-9 (specific surface area 60m<sup>2</sup>/g, particle diameter 40mmicro) and #3500 (specific surface area 47m<sup>2</sup>/g.) Particle diameter 40mmicro, Denker 100 [ HS-] (specific surface area 32m<sup>2</sup>/g, particle diameter 53mmicro), ASAHI HS-500 (specific surface area 37m<sup>2</sup>/g, particle diameter 76mmicro), etc. can be mentioned.

[0018]As content of carbon black in a conductive composition concerning this invention, it is usually 8 to 15 % of the weight preferably five to 30% of the weight. If a conductive composition may stop being able to demonstrate sufficient conductivity when there is less content of carbon black than said amount of ranges, and there is more content of carbon black than said range, When content of vapor-phase-epitaxy carbon fiber decreases relatively or content of a resinous principle decreases, a track which conductivity formed using this conductive composition in fully not being demonstrated \*\*\*\* may produce inconvenience which exfoliates easily from a substrate.

[0019]- It has a conductive composition concerning resinous principle-this invention as a matrix by using a resinous principle as a binder. Thermoplastics and thermosetting resin can be mentioned as a resinous principle.

[0020]As thermoplastics, for example Polyethylene, polypropylene, polybutene, Polystyrene, Polly p-xylene, polyvinyl acetate, polyacrylate, Polymethacrylate, polyvinyl chloride, a polyvinylidene chloride, polyacrylonitrile, polyvinyl ether, polyvinyl ketone, polyether, polycarbonate, polyester, polyamide, fluororesin, butadiene series resin, polyurethane system resin, etc. are mentioned.

[0021]Also in these thermoplastics, polyethylene, polypropylene, polyamide, etc. are used

suitably. These thermoplastics may use two or more sorts together, using the kind independently. As thermosetting resin, phthalic resin, phenol resin, furan resin, xylene formaldehyde resins, urea resin, melamine resin, aniline resin, unsaturated polyester resin, an epoxy resin, etc. can be mentioned, for example. Also in these, phthalic resin, phenol resin, an epoxy resin, etc. are preferred.

[0022] Depending on the case, a kind of thermoplastics, its two or more sorts and kind of thermosetting resin, or its two sorts or more may be used together.

[0023] A rate that thermoplastics in a conductive composition of this invention and/or thermosetting resin occupy is usually 40 to 65 % of the weight preferably 30 to 75% of the weight. If a content ratio of a resinous principle is less than said range, even if it will form a track using a conductive composition, when the track exfoliates easily and it exceeds said range, it may become a conductive composition which does not have sufficient conductivity.

[0024]- A conductive composition concerning additive agent-this invention can be made to contain publicly known various additive agents in the range which does not check the purpose of this invention. As an additive agent, a plasticizer, stabilizer, a filler, a reinforcing agent, an antioxidant, an ultraviolet ray absorbent, fire retardant, lubricant, etc. can be mentioned. It can be suitably determined by what kind of use is presented with a conductive composition concerning this invention what kind of additive agent is used.

[0025]- A conductive composition of preparation-this invention of a conductive composition can be obtained by mixing said vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle. A publicly known mixer can be used when mixing. There is no restriction in particular in a combination order of each ingredient. A method of preparing a conductive paint and conductive ink using this conductive composition is mentioned later.

[0026]- A conductive composition concerning use-this invention of a conductive composition has good conductivity. Then, a conductive paint and conductive ink can be formed so that it may mention later using this conductive composition. Since this conductive composition makes a resinous principle a matrix, it has a moldability. Therefore, when this conductive composition fabricates this suitably, Low resistance bands, such as a facsimile electrode plate, an uncharged conveyor belt, It can develop for uses, such as a rubber-goods for medicine, electric conduction tire, IC accommodating case, roll [ for copy ] for - spinning, elastic electrode, element for heating, over-current and element for overheat prevention, electro-magnetic-interference-sealed-materials, various keyboard switch, and connector element, and a switch element.

[0027](2) A conductive paint and conductive ink concerning a conductive paint and conductive ink constituent-this invention contain said vapor-phase-epitaxy carbon fiber, carbon black, a resinous principle, and a solvent added if needed. It is as having mentioned above about vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle. According to a kind

of resinous principle, when a resinous principle is liquefied, A conductive composition which consists of said vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle, or a conductive composition which consists of an additive agent added if needed, vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle can be used as a conductive paint and conductive ink. When a resinous principle is a solid state, a conductive paint and conductive ink can be obtained with a conductive composition and a solvent which have an additive agent blended with said vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle if needed. A conductive composition which consists of said vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle even if a resinous principle is liquefied, Or when the viscosity of a conductive composition which consists of an additive agent added if needed, vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle is not enough, it is preferred to add a solvent suitably and to aim at adjustment of the viscosity.

[0028]When using a conductive composition as a conductive paint and conductive ink, it is preferred to keep the sum total of vapor-phase-epitaxy carbon fiber and carbon black from exceeding 60 % of the weight to the sum total of vapor-phase-epitaxy carbon fiber, carbon black, and a resinous principle. It is because intensity of a coat produced by applying a conductive paint or conductive ink falls and conductivity may not fully be demonstrated, if the sum total of vapor-phase-epitaxy carbon fiber and carbon black exceeds 60 % of the weight.

[0029]Unless it has an adverse effect to a subject which applies a conductive paint and conductive ink about said solvent, the usual solvent used for a paint or ink can be used. As an example of a solvent, aliphatic series system solvents, such as a mineral spirit, the No. 3 volatile oil, and kerosene, Vegetable solvents, such as turpentine and dipentene, benzol, a toluol, Hydrocarbon system solvents, such as aromatic solvents, such as a xylol, solvent naphtha, and high solvent C naphtha, and a naphthene system solvent, Alcohols solvents, such as methanol, ethanol, butanol, and amyl alcohol, Methyl acetate, ethyl acetate, butyl acetate, SAKUSAN amyl, octyl acetate, Ester solvents, such as benzyl acetate and cyclohexyl acetate, acetone, Ketones, such as methyl acetone, methyl ethyl ketone, cyclohexanone, and methylcyclohexanone, Methyl ether, glycol methyl ether, glycol ethyl ether, Nitro solvents, such as chlorine compound system solvents, such as ethers solvents, such as glycol butyl ether and dioxane, dimethylene chloride, and trichloroethylene, and 2-nitropropane, can be mentioned. It is good to use it according to a resinous principle to be used out of these, choosing a soluble good thing. These can also use the kind alone and can also use together those two or more sorts. The amount in particular of said solvent used does not have restriction, and the amount of anticipated use at the time of manufacturing a paint and ink is sufficient for it.

[0030]A conductive paint and conductive ink may contain other ingredients, unless conductivity is checked. As other ingredients, a plasticizer, a dry regulator, a surface-active agent, etc. can

be mentioned.

[0031]- A manufacture-conductive paint of a conductive paint can be manufactured like manufacture of the usual paint. That is, a resinous principle is dissolved in a solvent, for example using a high speed stirrer, and a varnish is manufactured. In the case of a large lot, said varnish, vapor-phase-epitaxy carbon fiber, and carbon black are blended, a tank mixer performs pre mixing in it, this is continuously milled in it by a sand mill, and viscosity is adjusted to it. In the case of a small lot, vapor-phase-epitaxy carbon fiber and carbon black, and said varnish are directly taught to attritor, and are milled, for example to it, and viscosity is adjusted. A ball mill and 3 rolls can also be used instead of said sand mill or attritor.

[0032]- Manufacture of conductive ink - This conductive ink can be manufactured like a manufacturing method of usual printing ink. That is, fundamentally, it has a process of combination of each ingredient, pre mixing, milling, adjustment, and filtration. Each of this process is not restricted as being independently performed by difference of a manufacturing installation. In this process, a method of milling and filtration changes with differences of viscosity. For example, when viscosity of conductive ink is high, the 3 rolling method, the kneader method, or a Frasch process is adopted and milled. 3 rolls are milled according to shearing force by difference in revolving speed of each roll.

Since washing is easy, it is suitable for small lot production.

The kneader method is milled by rotation of a braid of special shape. This is suitable for large lot production. A Frasch process can be called a method of performing simultaneously a process of combination of each of said ingredient, pre mixing, milling, adjustment, and filtration. When viscosity of conductive ink is low, media type dispersion machines, such as a sand mill, a ball mill, and attritor, are used.

[0033]In manufacturing conductive ink, can use a mixer, a kneader, a mill, etc. outside the above, but. What any are used should take into consideration various factors, such as viscosity of a mill base and ink, a lot size, productive efficiency, quality of ink, sealing nature, propriety of continuous running, economical efficiency, the ease of using, and safety, for cannot be overemphasized.

[0034]- As a subject which uses a conductive paint, - conductive paint for use of conductive ink, and conductive ink, especially if conductivity is needed for the coat, there will be no restriction. In particular, an electric circuit board like a printed circuit board can be suitably manufactured using this conductive paint and conductive ink.

[0035](3) An electric circuit board of \*\*\*\*\* had an electric circuit for wiring in a substrate face of tabular or film state, and has established a hole for part attachment according to a use. As a substrate, a polyester system board, a polyimide system board, a glass epoxy system board, a glass Teflon system board, a polyamidoimide system board, a polyethylene system board, a polyphenylene sulfide system board, etc. can be mentioned. This substrate may be a

monolayer, may be a multilayer, and may be formed with a composite material.

[0036]According to for what kind of use thickness of a substrate uses this electric circuit board, a suitable value is determined suitably. here -- as the use of this electric circuit board -- an object for household appliances (radio and a cassette tape recorder.) industrial use (a computer, a business machine, and educational aid.), such as a stereo, a calculator, a sewing machine, and a musical instrument an object for vehicles, such as medical equipment and NC apparatus (an instruments panel, control machinery, and a signal machine.) For [, such as display equipment ] communication information (a switchboard, a conveyance walkie-talkie, an information terminal, space communication, etc.), Various kinds of uses (a video game, an electronic control model, etc.), such as an object for aeronautical-navigation marine vessels, the universe and an object for arms (an electronic measuring machine machine, electronic-navigation apparatus, control machinery, etc.), toy clocks (a measuring machine machine, control machinery, etc.), \*\*s for photographs (a digital clock, a shutter, an exposure system, etc.), can be mentioned.

[0037]It may be formed in both sides of a substrate even if an electric circuit for wiring using a conductive paint or conductive ink is formed in one side of a substrate according to these uses of various kinds of. this electric circuit board -- a conductive paint or conductive ink -- print processes -- or it is dried and manufactured, in order to apply on a substrate by paint, and to harden with heat or an electron beam if needed or to remove a solvent. Film thickness of a conductive paint or conductive ink is usually 5-100 micrometers.

[0038]

[Example]Next, the example of this invention is shown.

(Example 1) Phenol resin (alcoholic meltable type, Sumitomo Bakelite Co., Ltd. make) 85 weight, butyral resin (made by Sekisui Chemical Co., Ltd.) 15 weight section, and carbitol 100 weight section are mixed, To the obtained mixture, it is vapor-phase-epitaxy carbon fiber (0.8 micrometer in diameter, and 10 micrometers in length.). The Nikkiso Co., Ltd. make and/or Ketchen black (Japanese EC sale) were added so that it might become the blending ratio that the content in such solid content is shown in drawing 1, and it kneaded with 3 rolls, and the constituent was manufactured. It prints to a polyester sheet at a line, and at 150 \*\*, this constituent was covered for 30 minutes and stiffened. The dry film thickness of this constituent was 25 micrometers.

[0039]The electric resistance value for two points which left the electric resistance value of this coat 25 mm by 2-mm width was measured, it converted into  $\omega/\text{sq. at } 25\text{micrometer}$  thickness, and the result as shown in drawing 1 was obtained. In drawing 1, curvilinear \*\* showed the case where used only Ketchen black and vapor-phase-epitaxy carbon fiber was not used as carbon, by 20 % of the weight or more than it, film strength of Ketchen black is low and it could not bear it at practical use. Therefore, the minimum resistance is 100 ohm/sq in

the range of practical use. It turns out that curvilinear \*\* shows the case where only vapor-phase-epitaxy carbon fiber is used as a carbon ingredient, and it does not fall to 45 or less ohm/sq so that clearly from drawing 1. Curvilinear \*\* fixes Ketchen black to 10% of the weight, and when changing the content of vapor-phase-epitaxy carbon fiber, it is related. The still lower resistance which was not acquired when carbon black and vapor-phase-epitaxy carbon fiber were alone used, respectively so that clearly from drawing 1 was acquired.

[0040](Example 2) VCM/PVC system resin (product made from Bakelite) was dissolved so that concentration might be 20% of the weight to methyl ethyl ketone, the graphite fiber and furnace black which graphitized vapor-phase-epitaxy carbon fiber were added into the mixture obtained, agitation mixing was carried out by the mixer to it, and the paint was obtained into it. This paint was applied to the substrate made of phenol resin at the line, and the coat of 25 micrometers of film thickness was obtained by drying. That conductivity was measured like said Example 1 about this coat. The result was shown in Table 1.

[0041]

[Table 1]

黒鉛化繊維			フーネスブラック	樹脂	電気抵抗値
直径 ( $\mu\text{m}$ )	長さ ( $\mu\text{m}$ )	使用量 (重量部)	使用量 (重量部)	使用量 (重量部)	( $\Omega/\text{sq}$ )
0.8	10	50	--	50	112
0.4	15	50	--	50	18.5
0.4	15	50	25	25	10.2

[0042]

[Effect of the Invention]distributing vapor-phase-epitaxy carbon fiber and carbon black in a resinous principle according to this invention -- a vapor-phase-epitaxy carbon line and carbon black -- it is not obtained if independent [ each ] -- the conductive composition which has far big conductivity can be provided. This conductive composition can be fabricated to various kinds of mold goods by having a moldability, and it can prepare a conductive paint or conductive ink by adding a solvent, corresponding to the kind of resinous principle. This

conductive paint and conductive ink can be applied to various kinds of subjects by print processes or paint, According to the content of vapor-phase-epitaxy carbon fiber and carbon black, conductivity and \*\*\*\*\* can be given to the subject, and, moreover, the conductive coating film does not exfoliate easily from a subject, but an adhesive property is good. As for the electric circuit board formed using this conductive paint or conductive ink, the electric circuit is simply formed by print processes or paint.

And it can be considered as a reliable electric circuit board, without an electric circuit rusting by [ as / in the former ] having used metal paste and a metal powder.

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[Translation done.]